

# A Guide to the National Income and Product Accounts of the United States

This guide presents information on the structure, definitions, and presentation that underlie the national income and product accounts (NIPAs) produced by the Bureau of Economic Analysis. The NIPAs show the composition of production and the distribution of incomes earned in production. Thus, they represent a critical element of the U.S. economic accounts, which are designed to provide a consistent and comprehensive picture of the Nation's economy. The NIPAs feature several widely followed measures of aggregate U.S. economic activity, including gross domestic product (GDP), gross domestic income (GDI), personal income, and personal saving among others. This guide is organized as follows:

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## Background and History of the NIPAs

The estimation of national income was initiated during the early 1930s, when the lack of comprehensive economic data frustrated the efforts of Presidents Hoover and Roosevelt to design policies to combat the Great Depression. In response to this need, the Department of Commerce commissioned Simon Kuznets of the National Bureau of Economic Research (NBER) to develop estimates of national income. Professor Kuznets headed a small group within the Bureau of Foreign and Domestic Commerce's Division of Economic Research. Professor Kuznets coordinated the work of researchers at the NBER in New York and his staff at Commerce. The estimates were presented in a report to the Senate in 1934, *National Income, 1929–32*.

The entry of the United States into World War II led to increased demand for data that could be used for wartime planning. Early in 1942, annual estimates of gross national product (GNP) were introduced to complement the estimates of national income. In addition, estimates were developed to detail how income was generated, received, and spent by various sectors of the economy.

The U.S. national income and product statistics were first presented as part of a complete and consistent accounting system in the July 1947 supplement to the SURVEY OF CURRENT BUSINESS. The supplement contained 48 tables covering the years 1929–46. All estimates were presented in current dollars; no adjustments were yet made for changes in purchasing power. Quarterly estimates were available for only a few of the aggregates (national income, GNP, and personal income, and their major components). Monthly estimates were presented for personal income and its major components.

In 1951, annual estimates of real GNP and of implicit price deflators were introduced as supplementary tables. Real GNP was calculated by holding fixed the prices of a particular base year that is—GNP was calculated in “constant dollars.” In 1954, these inflation-adjusted estimates were formally integrated into the standard NIPA tables.

Another revision, published in 1958, introduced changes in the accounting system and added new information to the accounts. Five summary accounts were adopted as a concise, general presentation of output, income, outlays, foreign transactions, saving, and investment. Quarterly estimates of real GNP were introduced. Government sector tables provided a new breakdown of expenditures by type and function for the Federal Government and for state and local governments. The foreign transactions tables were expanded in detail and integrated with the balance of payments accounts. Regional estimates were introduced, as were estimates of the net stock of fixed assets in manufacturing.

In the 1965 comprehensive revision, for the first time, the components of GNP were benchmarked to the detailed estimates contained in the 1958 input-output table, which provided a better understanding of the structural relationships within the economy.

During the 1960s and 1970s, the estimates of capital stock were expanded to cover all business and government owned fixed assets and consumer durable goods. In 1976, in order to provide a more consistent valuation, the estimates of consumption of fixed capital (CFC) were shifted to a current-cost basis. Previously, the estimates were on a book-value basis—that is, valued at historical cost—reflecting a mixture of prices for the various years in which the assets were acquired.

In 1985, BEA introduced quality-adjusted price indexes for computers and peripheral equipment that were developed with the assistance and advice of researchers from the IBM Corporation. The indexes, which were based on a statistical technique known as “hedonic” regression, adjusted for the rapid improvements in speed and capacity of computer equipment. These hedonic price indexes provide improved measures of price change for computers and peripheral equipment during periods when quality characteristics change rapidly and when prices decline as new products are introduced.

In 1991, BEA changed its featured measure of U.S. production from GNP to GDP. GDP covers the goods





## Definitions and Classifications Underlying the NIPAs

### NIPA entries

The national income and product accounts (NIPAs) are summarized in seven accounts that show the composition of production and the distribution of incomes earned in production.<sup>12</sup> The seven summary accounts are shown in table A. For illustrative purposes, the tables show estimates for 2005 that are based on the latest published NIPA estimates.

Each of the components in the summary accounts also enters one of the other summary accounts and is shown in one or more of the tables that make up the full set of 299 NIPA tables. Taken together, the summary accounts constitute a double-entry system in which a use (or expenditure) recorded in one account for one sector is also recorded as a source (or receipt) in an account of another sector or of the same sector.<sup>13</sup> This system of integrated, double-entry accounts provides a comprehensive measure of economic activity in a consistently defined framework without double counting. Thus, the NIPAs, in combination with BEA's industry, wealth, and regional accounts, can be used to trace the principal economic flows among the major sectors of the economy.

The first account, the domestic income and product account, shows the consolidated—that is, unduplicated—production of all sectors of the economy as the sum of goods and services sold to final users on the right side and the income generated by that produc-

tion on the left side.<sup>14</sup> The private enterprise income account (account 2) provides additional information on the sources and uses of income by private enterprises, which give rise to the bulk of the output in the U.S. economy. Accounts 3–5 show the receipts and expenditures of the other major sectors of the U.S. economy: The personal sector, which is made up of households and nonprofit institutions serving households; the government sector; and the foreign sector. Account 6 provides information on the saving and investment of the domestic sectors of the economy, and account 7 provides information on capital transactions with the rest of the world.

Within the summary accounts, each entry has a counterentry, generally in another account. The parenthetical numbers that follow an entry in table A identify the counterentry by account and line number. With the exception of major income and product aggregates, entries are usually defined in the sequence in which they appear in the seven-account summary. The definition is not repeated where the counterentry appears, but a cross reference is made to the place of its first appearance. After the seven-account-summary discussion, definitions for the following items are presented: Final sales of domestic product, gross domestic purchases, final sales to domestic purchasers, net interest, fixed assets, produced assets, nonproduced assets, population, personal saving as a percentage of disposable personal income, gross saving as a percentage of gross national income, U.S. residents, foreign residents, and the rest of the world.

12. Prior to the 2003 comprehensive revision, the NIPAs were summarized in five accounts, which are shown in table A of the August 2002 *SURVEY* on pages 38–39. For a discussion of the differences between the old and new summary accounts, see Nichole Mayerhauser, Shelly Smith, and David F. Sullivan, “Preview of the 2003 Comprehensive Revision of the National Income and Product Accounts: New and Redesigned Tables,” *SURVEY* 83 (August 2003): 8–15.

13. For more information on the concepts underlying the accounts, see U.S. Bureau of Economic Analysis (BEA), “An Introduction to National Economic Accounting,” methodology paper, forthcoming, and *SNA 1993*.

14. The estimate of GDP avoids double counting (of, for example, the semiconductors that go into computers or the flour that goes into bread) because the purchase by one business of materials and services on current account (intermediate purchases) from another business is canceled by the corresponding sale by another business in the consolidation.



Table A. Summary National Income and Product Accounts, 2005

[Billions of dollars]

## Account 1. Domestic Income and Product Account

| Line |  |                 | Line |  |                 |
|------|--|-----------------|------|--|-----------------|
| 1    | Compensation of employees, paid .....                  | 7,036.6         | 15   | Personal consumption expenditures (3-3) .....                                | 8,742.4         |
| 2    | Wage and salary accruals .....                         | 5,671.1         | 16   | Durable goods .....  | 1,033.1         |
| 3    | Disbursements (3-12 and 5-11) .....                    | 5,671.1         | 17   | Nondurable goods .....   | 2,539.3         |
| 4    | Wage accruals less disbursements (4-9 and 6-11) .....  | 0.0             | 18   | Services .....   | 5,170.0         |
| 5    | Supplements to wages and salaries (3-14) .....         | 1,365.5         | 19   | Gross private domestic investment .....                                      | 2,057.4         |
| 6    | Taxes on production and imports (4-16) .....           | 922.4           | 20   | Fixed investment (6-2) .....   | 2,036.2         |
| 7    | Less: Subsidies (4-8) .....                            | 57.3            | 21   | Nonresidential .....   | 1,265.7         |
| 8    | Net operating surplus .....                            | 2,878.2         | 22   | Structures .....   | 338.6           |
| 9    | Private enterprises (2-19) .....                       | 2,893.6         | 23   | Equipment and software .....   | 927.1           |
| 10   | Current surplus of government enterprises (4-26) ..... | -15.4           | 24   | Residential .....  | 770.4           |
| 11   | Consumption of fixed capital (6-13) .....              | 1,604.8         | 25   | Change in private inventories (6-4) .....                                    | 21.3            |
| 12   | <b>Gross domestic income</b> .....                     | <b>12,384.8</b> | 26   | Net exports of goods and services .....                                      | -716.7          |
| 13   | Statistical discrepancy (6-19) .....                   | 71.0            | 27   | Exports (5-1) .....  | 1,303.1         |
|      |  |                 | 28   | Imports (5-9) .....  | 2,019.9         |
|      |  |                 | 29   | Government consumption expenditures and gross investment (4-1 and 6-3) ..... | 2,372.8         |
|      |  |                 | 30   | Federal .....  | 878.3           |
|      |  |                 | 31   | National defense .....   | 589.3           |
|      |  |                 | 32   | Nondefense .....   | 289.0           |
|      |  |                 | 33   | State and local .....  | 1,494.4         |
| 14   | <b>GROSS DOMESTIC PRODUCT</b> .....                    | <b>12,455.8</b> | 34   | <b>GROSS DOMESTIC PRODUCT</b> .....  | <b>12,455.8</b> |

## Account 2. Private Enterprise Income Account

| Line |   |                | Line |  |                |
|------|---|----------------|------|--|----------------|
| 1    | Income payments on assets .....   | 2,552.4        | 19   | Net operating surplus (1-9) .....                                | 2,893.6        |
| 2    | Interest and miscellaneous payments (3-20 and 4-21) .....   | 2,411.4        | 20   | Income receipts on assets .....                                  | 2,107.1        |
| 3    | Dividend payments to the rest of the world (5-14) .....   | 81.8           | 21   | Interest (3-20) .....  | 1,769.1        |
| 4    | Reinvested earnings on foreign direct investment in the United States (5-15) .....                        | 59.2           | 22   | Dividend receipts from the rest of the world (5-6) .....         | 320.0          |
| 5    | Business current transfer payments (net) .....  | 74.2           | 23   | Reinvested earnings on U.S. direct investment abroad (5-7) ..... | 18.0           |
| 6    | To persons (net) (3-24) .....   | 45.7           |      |  |                |
| 7    | To government (net) (4-24) .....  | 30.1           |      |  |                |
| 8    | To the rest of the world (net) (5-19) .....   | -1.6           |      |  |                |
| 9    | Proprietors' income with inventory valuation and capital consumption adjustments (3-17) .....             | 970.7          |      |  |                |
| 10   | Rental income of persons with capital consumption adjustment (3-18) .....                                 | 72.8           |      |  |                |
| 11   | Corporate profits with inventory valuation and capital consumption adjustments .....                      | 1,330.7        |      |  |                |
| 12   | Taxes on corporate income .....   | 399.3          |      |  |                |
| 13   | To government (4-17) .....  | 384.4          |      |  |                |
| 14   | To the rest of the world (5-19) .....   | 14.9           |      |  |                |
| 15   | Profits after tax with inventory valuation and capital consumption adjustments .....                      | 931.4          |      |  |                |
| 16   | Net dividends (3-21 and 4-22) .....   | 576.9          |      |  |                |
| 17   | Undistributed corporate profits with inventory valuation and capital consumption adjustments (6-10) ..... | 354.5          |      |  |                |
| 18   | <b>USES OF PRIVATE ENTERPRISE INCOME</b> .....  | <b>5,000.7</b> | 24   | <b>SOURCES OF PRIVATE ENTERPRISE INCOME</b> .....                | <b>5,000.7</b> |

## Account 3. Personal Income and Outlay Account

| Line |  |                 | Line |  |                 |
|------|--|-----------------|------|--|-----------------|
| 1    | Personal current taxes (4-15) .....              | 1,203.1         | 10   | Compensation of employees, received .....  | 7,030.3         |
| 2    | Personal outlays .....                           | 9,070.9         | 11   | Wage and salary disbursements .....  | 5,664.8         |
| 3    | Personal consumption expenditures (1-15) .....   | 8,742.4         | 12   | Domestic (1-3 less 5-11) .....   | 5,661.9         |
| 4    | Personal interest payments (3-20) .....          | 209.4           | 13   | Rest of the world (5-3) .....  | 2.9             |
| 5    | Personal current transfer payments .....         | 119.2           | 14   | Supplements to wages and salaries (1-5) .....  | 1,365.5         |
| 6    | To government (4-25) .....                       | 72.0            | 15   | Employer contributions for employee pension and insurance funds .....                        | 933.2           |
| 7    | To the rest of the world (net) (5-17) .....      | 47.1            | 16   | Employer contributions for government social insurance .....                                 | 432.3           |
| 8    | Personal saving (6-9) .....                      | -34.8           | 17   | Proprietors' income with inventory valuation and capital consumption adjustments (2-9) ..... | 970.7           |
|      |  |                 | 18   | Rental income of persons with capital consumption adjustment (2-10) .....                    | 72.8            |
|      |  |                 | 19   | Personal income receipts on assets .....   | 1,519.4         |
|      |  |                 | 20   | Personal interest income (2-2 and 3-4 and 4-7 and 5-5 less 2-21 less 4-21 less 5-13) .....   | 945.0           |
|      |  |                 | 21   | Personal dividend income (2-16 less 4-22) .....  | 574.4           |
|      |  |                 | 22   | Personal current transfer receipts .....   | 1,526.6         |
|      |  |                 | 23   | Government social benefits (4-4) .....   | 1,480.9         |
|      |  |                 | 24   | From business (net) (2-6) .....  | 45.7            |
|      |  |                 | 25   | Less: Contributions for government social insurance (4-19) .....                             | 880.6           |
| 9    | <b>PERSONAL TAXES, OUTLAYS, AND SAVING</b> ..... | <b>10,239.2</b> | 26   | <b>PERSONAL INCOME</b> .....   | <b>10,239.2</b> |

## Account 4. Government Receipts and Expenditures Account

| Line |   |                | Line |  |                |
|------|---|----------------|------|--|----------------|
| 1    | Consumption expenditures (1-29) .....                                       | 1,975.7        | 14   | Current tax receipts .....                                 | 2,520.7        |
| 2    | Current transfer payments .....   | 1,517.8        | 15   | Personal current taxes (3-1) .....                         | 1,203.1        |
| 3    | Government social benefits .....  | 1,484.0        | 16   | Taxes on production and imports (1-6) .....                | 922.4          |
| 4    | To persons (3-23) .....   | 1,480.9        | 17   | Taxes on corporate income (2-13) .....                     | 384.4          |
| 5    | To the rest of the world (5-18) .....                                       | 3.1            | 18   | Taxes from the rest of the world (5-18) .....              | 10.8           |
| 6    | Other current transfer payments to the rest of the world (net) (5-18) ..... | 33.9           | 19   | Contributions for government social insurance (3-25) ..... | 880.6          |
| 7    | Interest payments (3-20) .....  | 348.0          | 20   | Income receipts on assets .....                            | 98.3           |
| 8    | Subsidies (1-7) .....   | 57.3           | 21   | Interest and miscellaneous receipts (2-2 and 3-20) .....   | 95.8           |
| 9    | Less: Wage accruals less disbursements (1-4) .....                          | 0.0            | 22   | Dividends (3-21) .....                                     | 2.4            |
| 10   | Net government saving (6-12) .....  | -312.5         | 23   | Current transfer receipts .....                            | 102.1          |
| 11   | Federal .....   | -309.2         | 24   | From business (net) (2-7) .....                            | 30.1           |
| 12   | State and local .....   | -3.3           | 25   | From persons (3-6) .....                                   | 72.0           |
| 13   | <b>GOVERNMENT CURRENT EXPENDITURES AND NET SAVING .....</b>                 | <b>3,586.3</b> | 26   | Current surplus of government enterprises (1-10) .....     | -15.4          |
|      |   |                | 27   | <b>GOVERNMENT CURRENT RECEIPTS .....</b>                   | <b>3,586.3</b> |

## Account 5. Foreign Transactions Current Account

| Line |   |                | Line |   |                |
|------|---|----------------|------|---|----------------|
| 1    | Exports of goods and services (1-27) .....                        | 1,303.1        | 9    | Imports of goods and services (1-28) .....  | 2,019.9        |
| 2    | Income receipts from the rest of the world .....                  | 513.3          | 10   | Income payments to the rest of the world .....  | 481.5          |
| 3    | Wage and salary receipts (3-13) .....                             | 2.9            | 11   | Wage and salary payments (1-3) .....  | 9.2            |
| 4    | Income receipts on assets .....                                   | 510.4          | 12   | Income payments on assets .....   | 472.2          |
| 5    | Interest (3-20) .....   | 172.4          | 13   | Interest (3-20) .....   | 331.2          |
| 6    | Dividends (2-22) .....  | 320.0          | 14   | Dividends (2-3) .....   | 81.8           |
| 7    | Reinvested earnings on U.S. direct investment abroad (2-23) ..... | 18.0           | 15   | Reinvested earnings on foreign direct investment in the United States (2-4) .....     | 59.2           |
|      |   |                | 16   | Current taxes and transfer payments to the rest of the world (net) .....              | 86.6           |
|      |   |                | 17   | From persons (net) (3-7) .....  | 47.1           |
|      |   |                | 18   | From government (net) (4-5 and 4-6 less 4-18) .....                                   | 26.1           |
|      |   |                | 19   | From business (net) (2-8 and 2-14) .....  | 13.3           |
|      |   |                | 20   | Balance on current account, national income and product accounts (7-1) .....          | -771.4         |
| 8    | <b>CURRENT RECEIPTS FROM THE REST OF THE WORLD .....</b>          | <b>1,816.5</b> | 21   | <b>CURRENT PAYMENTS TO THE REST OF THE WORLD AND BALANCE ON CURRENT ACCOUNT .....</b> | <b>1,816.5</b> |

## Account 6. Domestic Capital Account

| Line |   |                | Line |   |                |
|------|---|----------------|------|---|----------------|
| 1    | Gross domestic investment .....   | 2,454.5        | 8    | Net saving .....  | 7.2            |
| 2    | Private fixed investment (1-20) .....   | 2,036.2        | 9    | Personal saving (3-8) .....   | -34.8          |
| 3    | Government fixed investment (1-29) .....  | 397.1          | 10   | Undistributed corporate profits with inventory valuation and capital consumption adjustments (2-17) ..... | 354.5          |
| 4    | Change in private inventories (1-25) .....  | 21.3           | 11   | Wage accruals less disbursements (private) (1-4) .....  | 0.0            |
| 5    | Capital account transactions (net) (7-2) .....  | 4.4            | 12   | Net government saving (4-10) .....  | -312.5         |
| 6    | Net lending or net borrowing (-), national income and product accounts (7-3) .....    | -775.8         | 13   | Plus: Consumption of fixed capital (1-11) .....   | 1,604.8        |
|      |   |                | 14   | Private .....   | 1,352.6        |
|      |   |                | 15   | Government .....  | 252.2          |
|      |   |                | 16   | General government .....  | 207.2          |
|      |   |                | 17   | Government enterprises .....  | 45.1           |
| 7    | <b>GROSS DOMESTIC INVESTMENT, CAPITAL ACCOUNT TRANSACTIONS, AND NET LENDING .....</b> | <b>1,683.1</b> | 18   | Equals: Gross saving .....  | 1,612.0        |
|      |   |                | 19   | Statistical discrepancy (1-13) .....  | 71.0           |
|      |   |                | 20   | <b>GROSS SAVING AND STATISTICAL DISCREPANCY .....</b>   | <b>1,683.1</b> |

## Account 7. Foreign Transactions Capital Account

| Line |  |               | Line |   |               |
|------|--|---------------|------|---|---------------|
| 1    | <b>BALANCE ON CURRENT ACCOUNT, NATIONAL INCOME AND PRODUCT ACCOUNTS (5-20) .....</b> | <b>-771.4</b> | 2    | Capital account transactions (net) (6-5) .....  | 4.4           |
|      |  |               | 3    | Net lending or net borrowing (-), national income and product accounts (6-6) .....                    | -775.8        |
|      |  |               | 4    | <b>CAPITAL ACCOUNT TRANSACTIONS (NET) AND NET LENDING, NATIONAL INCOME AND PRODUCT ACCOUNTS .....</b> | <b>-771.4</b> |

NOTE. Numbers in parentheses indicate accounts and items of counterentry in the accounts. For example, line 5 of account 1 is shown as "Supplements to wages and salaries (3-14)"; the counterentry is shown in account 3, line 14.



























## Presentation of the NIPAs

This section describes the release schedule for the NIPA estimates, the publication of the NIPA tables, and additional presentations of NIPA and NIPA related estimates.<sup>47</sup>

### Release schedule

For GDP and most other NIPA series, quarterly estimates are released on the following schedule: “Advance” estimates are released near the end of the first month after the end of the quarter; as more detailed and more comprehensive data become available, “preliminary” and “final” estimates are released near the end of the second and third months, respectively.

For gross national product, gross domestic income, national income, corporate profits, and net interest, “advance” estimates are not prepared, because of a lag in the availability of source data. Except for the fourth quarter estimates, the initial estimates for these series are released with the preliminary GDP estimates, and the revised estimates are released with the final GDP estimates. For the fourth quarter, these estimates are released only with the final GDP estimates.

In addition, when the preliminary estimates of GDP for the current quarter are released, BEA releases revised estimates of private wages and salaries and affected income-side aggregates for the previous quarter.<sup>48</sup> This permits the incorporation of the most recently available wage and salary data from the quarterly census of employment and wages.

Monthly estimates of personal income and outlays are released near the end of the month following the

reference month; estimates for the preceding 2 to 4 months are subject to revision at that time.

Annual revisions of the NIPAs are usually carried out each summer and cover the months and quarters of the most recent calendar year and of the 2 preceding years. These revisions are timed to incorporate newly available major annual source data.<sup>49</sup>

Comprehensive revisions are carried out at about 5-year intervals. They incorporate definitional, statistical, and presentational improvements.

### Publication of the NIPA tables

Tables that present the NIPA estimates appear each month under “National Data” in the section “BEA Current and Historical Data” in the SURVEY OF CURRENT BUSINESS and on BEA’s Web site.<sup>50</sup> The full set of NIPA tables consists of 299 tables that present annual, quarterly, and monthly estimates.

With the release of the 12th comprehensive revision of the NIPAs, the presentation of the NIPA tables was organized to group tables with similar formats in one section of the NIPA tables. To assist users in identifying the type of estimate in a table, a numbering system for NIPA tables was developed for groups of tables that display different types of estimates using similar formats. The table-numbering system highlights the type of estimate (such as current dollars, quantity indexes, and percent changes) in the table. The new system is outlined below.

Table numbers are in the format “X.Y.Z.” where “X” indicates the NIPA table section, “Y” indicates the table number in the section, and “Z” indicates the type of estimate presented.

47. For additional details on the availability of BEA’s products and services, see BEA’s Web site at <www.bea.gov>.

48. Affected aggregates include gross domestic income, the statistical discrepancy, gross national income, national income, personal income, disposable personal income, personal saving, gross (national) saving, compensation, and gross product of corporate business. Other components that are closely linked to wages and salaries, such as personal current taxes and employer contributions for government social insurance are also revised. However, GDP and its components are not affected.

49. For a discussion of the most recent annual revision of the NIPAs, see Eugene P. Seskin and Shelly Smith, “Annual Revision of the National Income and Product Accounts,” SURVEY 86 (August 2006): 7–31.

50. The NIPA estimates appear first in news releases, which are available to the general public in a variety of forms.





## Statistical Conventions Used for NIPA Estimates

Most of the NIPA estimates are presented in current dollars. Changes in current-dollar estimates measure the changes in the market values of goods or services that are produced or sold in the economy. For many purposes, it is necessary to decompose these changes into price and quantity components. Prices are expressed as index numbers with the reference year at present, the year 2000 equal to 100. Quantities, or “real” measures, are expressed as index numbers with the reference year (2000) equal to 100; for selected series, they are also expressed in chained (2000) dollars. (For further details, see the section “Real Output and Related Measures.”)

### Seasonal adjustment

Quarterly and monthly NIPA estimates are seasonally adjusted at the detailed series level when the series demonstrate statistically significant seasonal patterns. For most of the series that are seasonally adjusted by the source agency, BEA adopts the corresponding seasonal adjustment factors. Seasonal adjustment removes from the time series the average effect of variations that normally occur at about the same time and in about the same magnitude each year—for example, weather and holidays. After seasonal adjustment, cyclical and other short term changes in the economy stand out more clearly.

### Annual rates

Quarterly and monthly NIPA estimates in current and chained dollars are presented at annual rates, which show the value that would be registered if the rate of activity measured for a quarter or a month were maintained for a full year. Annual rates are used so that periods of different lengths—for example, quarters and years—may be easily compared. These annual rates are determined simply by multiplying the estimated rate of activity by 4 (for quarterly data) or by 12 (for monthly data).

Percent changes in the estimates are also expressed at annual rates. Calculating these changes requires a variant of the compound interest formula,

$$r = \left[ \left( \frac{GDP_t}{GDP_0} \right)^{m/n} - 1 \right] \times 100 ,$$

where

- $r$  is the percent change at an annual rate;
- $GDP_t$  is the level of activity in the later period;
- $GDP_0$  is the level of activity in the earlier period;
- $m$  is the periodicity of the data (for example, 1 for annual data, 4 for quarterly, or 12 for monthly); and
- $n$  is the number of periods between the earlier and later periods (that is,  $t-0$ ).





### Appendix 3

#### Calculation of Component Contributions to the Change in GDP and Other Major Aggregates

The contributions to percent change in a real aggregate, such as real GDP, provide a measure of the composition of growth in the aggregate that is not affected by the nonadditivity of its components. This property makes contributions to percent change a valuable tool for economic analysis. The contribution to percent change ( $C\% \Delta_{i,t}$ ) in an aggregate in period  $t$  that is attributable to the quantity change in component  $i$  is defined by the formula

$$C\% \Delta_{i,t} = 100 \times \frac{\left( \left( p_{i,t} / P_t^F \right) + p_{i,t-1} \right) \times (q_{i,t} - q_{i,t-1})}{\sum_j \left( \left( p_{j,t} / P_t^F \right) + p_{j,t-1} \right) \times q_{j,t-1}},$$

where

$P_t^F$  is the Fisher price index for the aggregate in period  $t$  relative to period  $t-1$ ;

$p_{i,t}$  is the price of the component  $i$  in period  $t$ ; and

$q_{i,t}$  is the quantity of the component  $i$  in period  $t$ .

The summation with subscript  $j$  in the denominator includes all the deflation level components of the ag-

gregate. Contributions of subaggregates (such as PCE goods) to the percent change of the aggregate (say, PCE or GDP) are calculated by summing the contributions of all the deflation level components contained in the subaggregate.

For annual estimates, no adjustments are required for contributions to sum exactly to the percent change in the aggregate. For quarterly estimates, adjustments are required to offset the effects of adjustments made to published aggregates and their quarterly percent change: namely, conforming quarterly estimates to average to the corresponding annual estimates, and expressing percent change at annual rate. The same formula is used for both annual and quarterly estimates of contributions to percent change in all periods. The only variation in the method of calculation is that when the annual contributions for the most recent year are first calculated, they are based on a weighted average of the quarterly contributions until the next annual revision.